



WHITE DOG LABS

New Opportunities for Ethanol Assets

March 8, 2019

White Dog Labs – What's in the name?



Bourbon before barrel aging is called “White Dog”

About White Dog Labs



Biotechnology company focused on animal health and nutrition today – humans tomorrow

Microbiome driven technology-platform – Tyton

Current products in commercialization: **ProTyton™**, **MiruTyton™** and **BioTyton™**

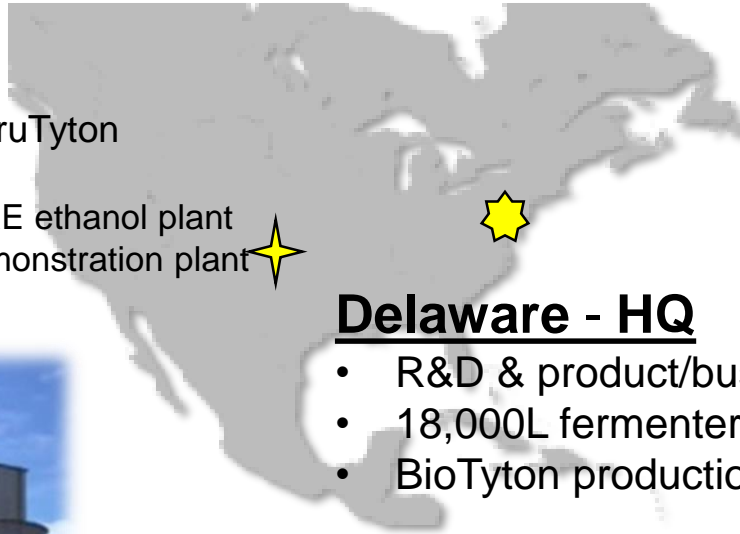
First, second and hopefully third commercial deployment will be in Nebraska

White Dog Labs Locations



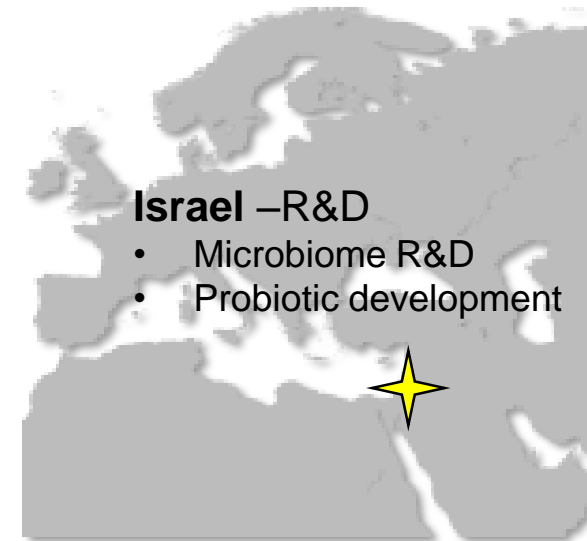
Nebraska – ProTyton & MiruTyton Production

- Reached agreement with MRE ethanol plant
- 2019/20 - Production demonstration plant
 - 2021 - Production plant



Delaware - HQ

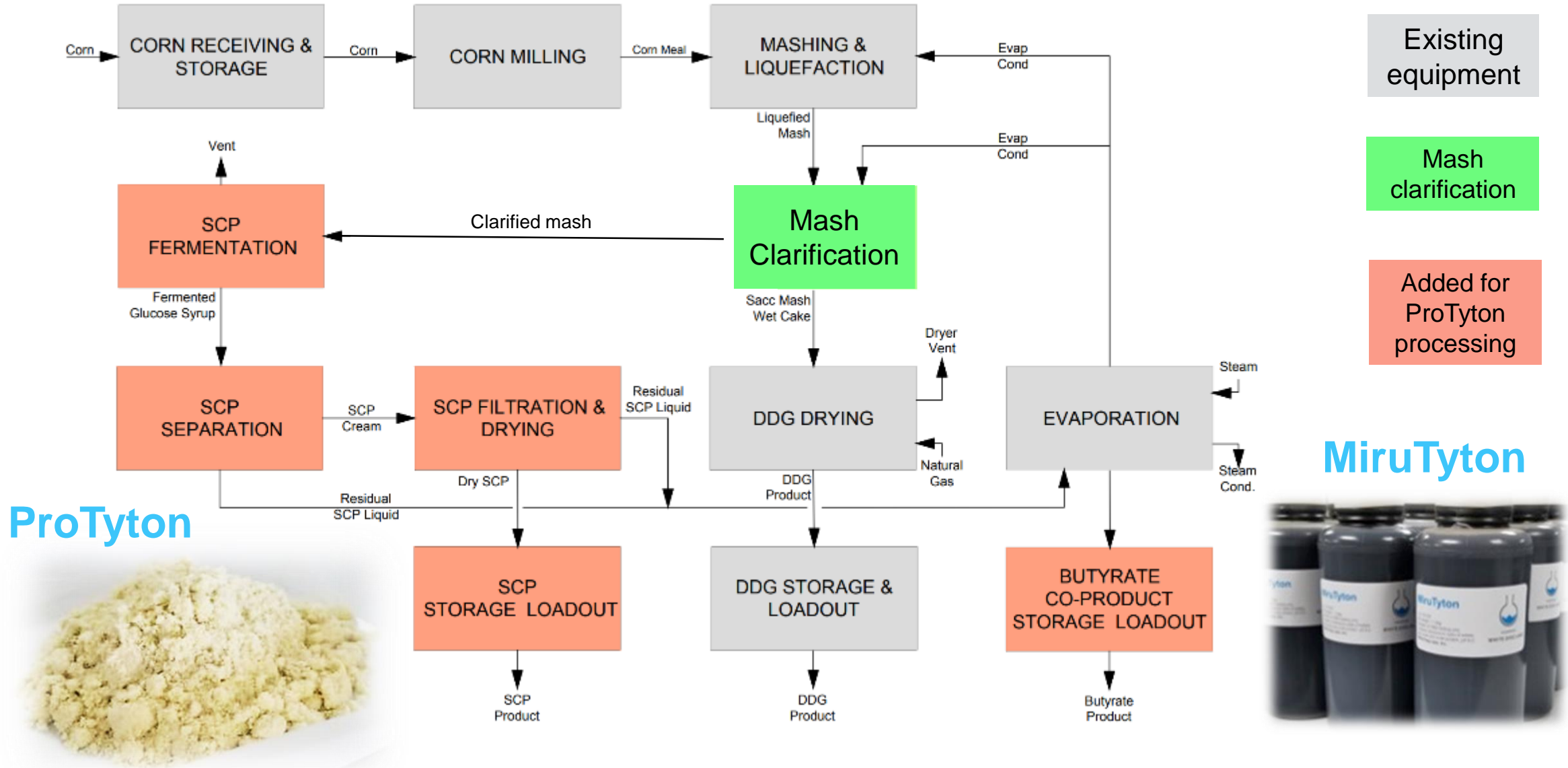
- R&D & product/business development
- 18,000L fermenter pilot line
- BioTyton production site



Israel –R&D

- Microbiome R&D
- Probiotic development

Ethanol Plant Conversion to Protein and Feed Additives



WDL's Product Portfolio & Opportunity in NE



Co-products – MRE Production

ProTyton™

Premium protein for aquaculture



Bringing the sea to the heartland

MiruTyton™

Naturally produced, Butyrate-rich feed-additive



Working with UNL to bring performance additives to cattle

BioTyton™

In-ovo probiotics for poultry



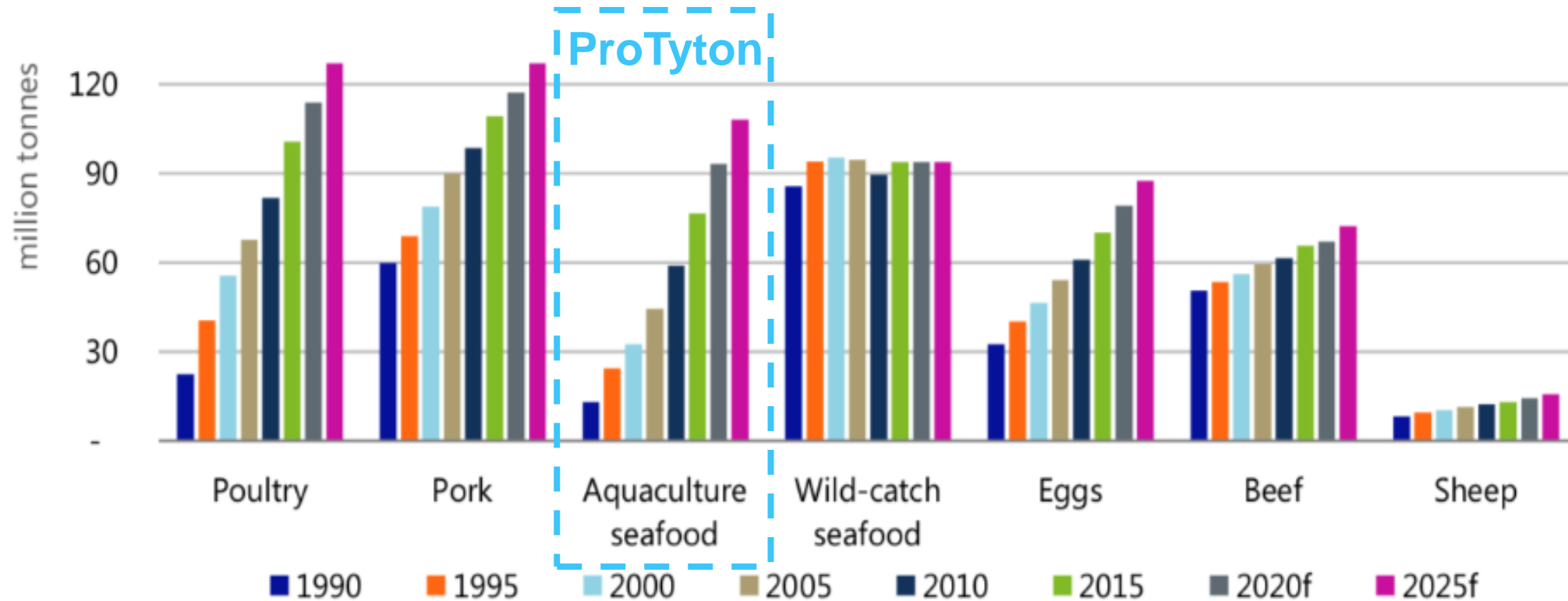
Novel products for Nebraska's newest ag industry - broilers

Large volume or emerging products for animal health and nutrition

White Dog Labs Served Markets



Global Animal Protein Consumption



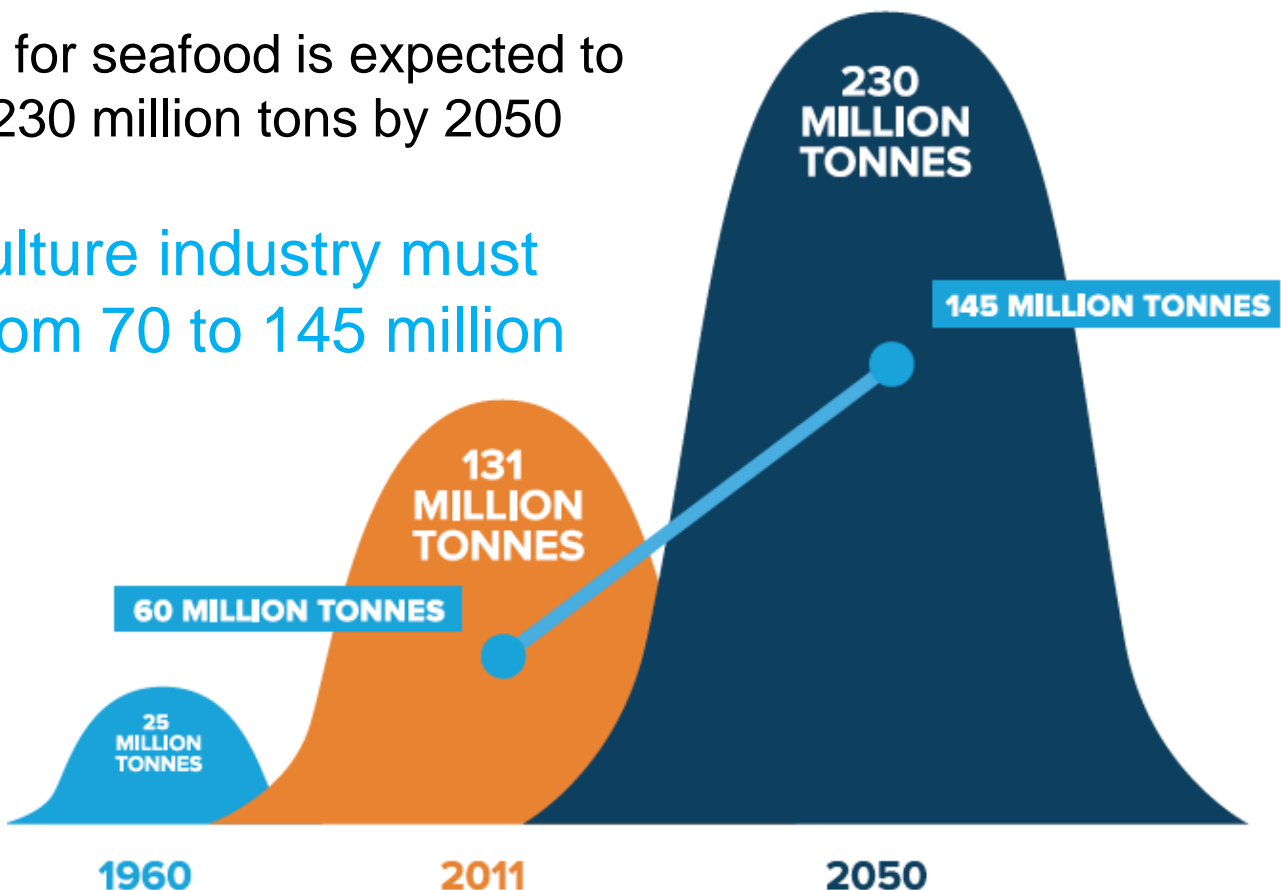
Source: Rabobank

Future Forecast for Aquaculture



Demand for seafood is expected to grow to 230 million tons by 2050

Aquaculture industry must grow from 70 to 145 million tons



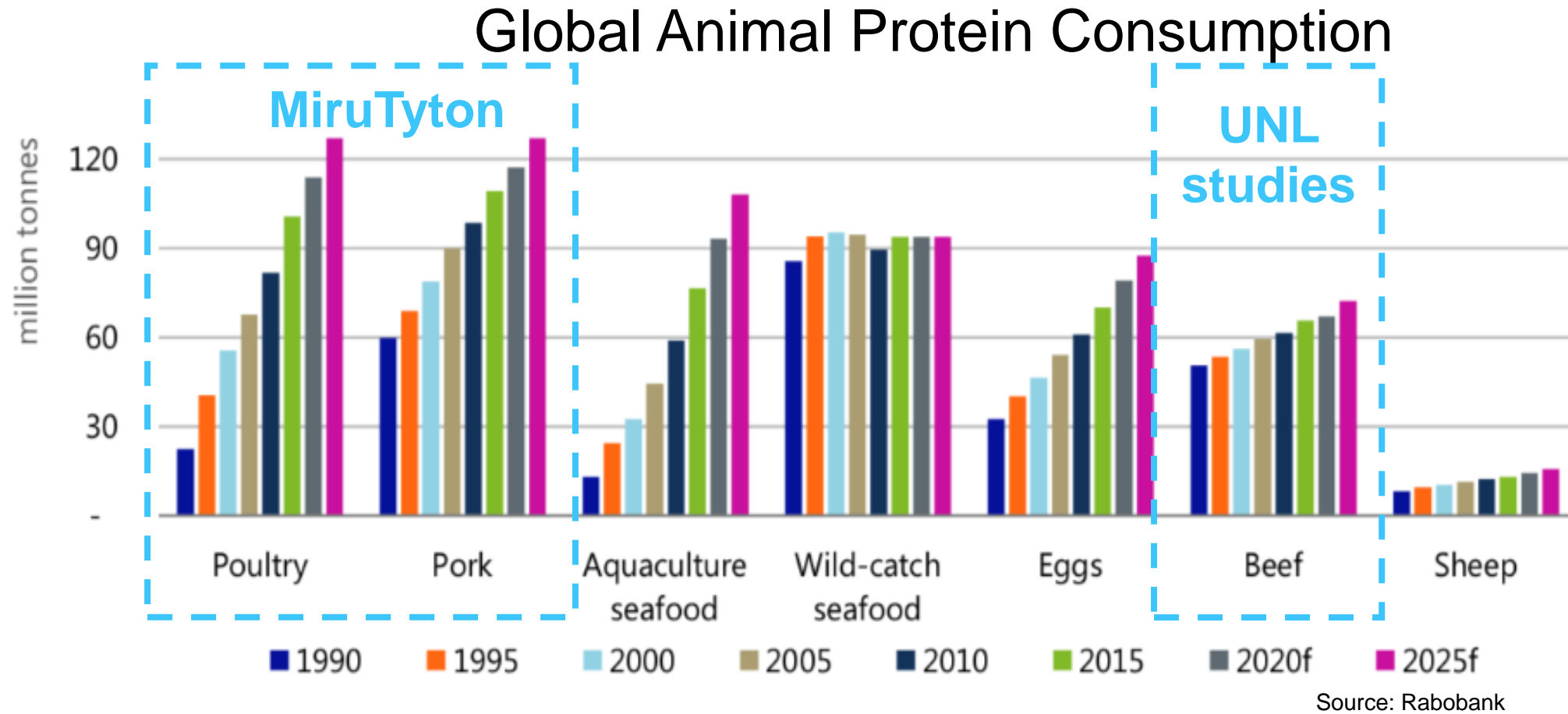
\$300B

Farm gate value / year*

*Source: Worldfish – Aquaculture Futures: Supply and demand trends.

Tremendous market growth projected yielding a large market opportunity

White Dog Labs Served Markets

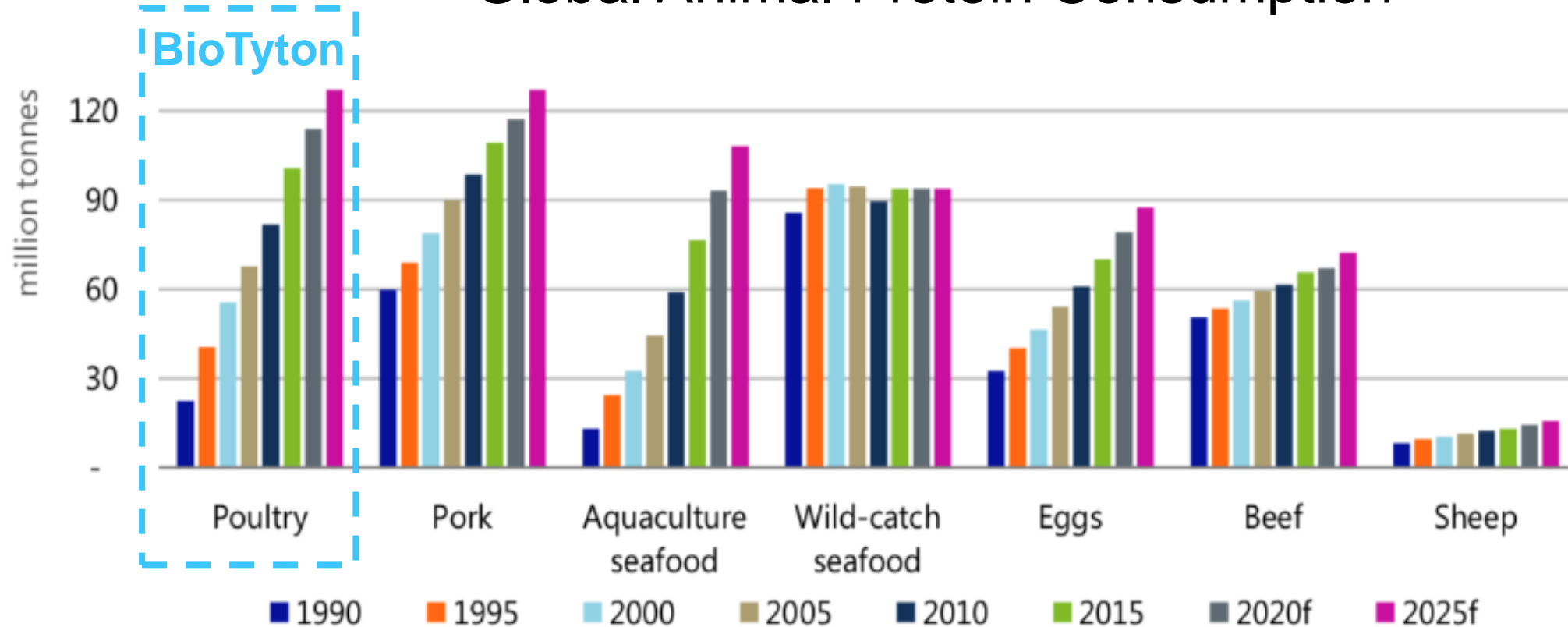


Economics to drive elastic markets – honoring the cow

White Dog Labs Served Markets



Global Animal Protein Consumption



Source: Rabobank

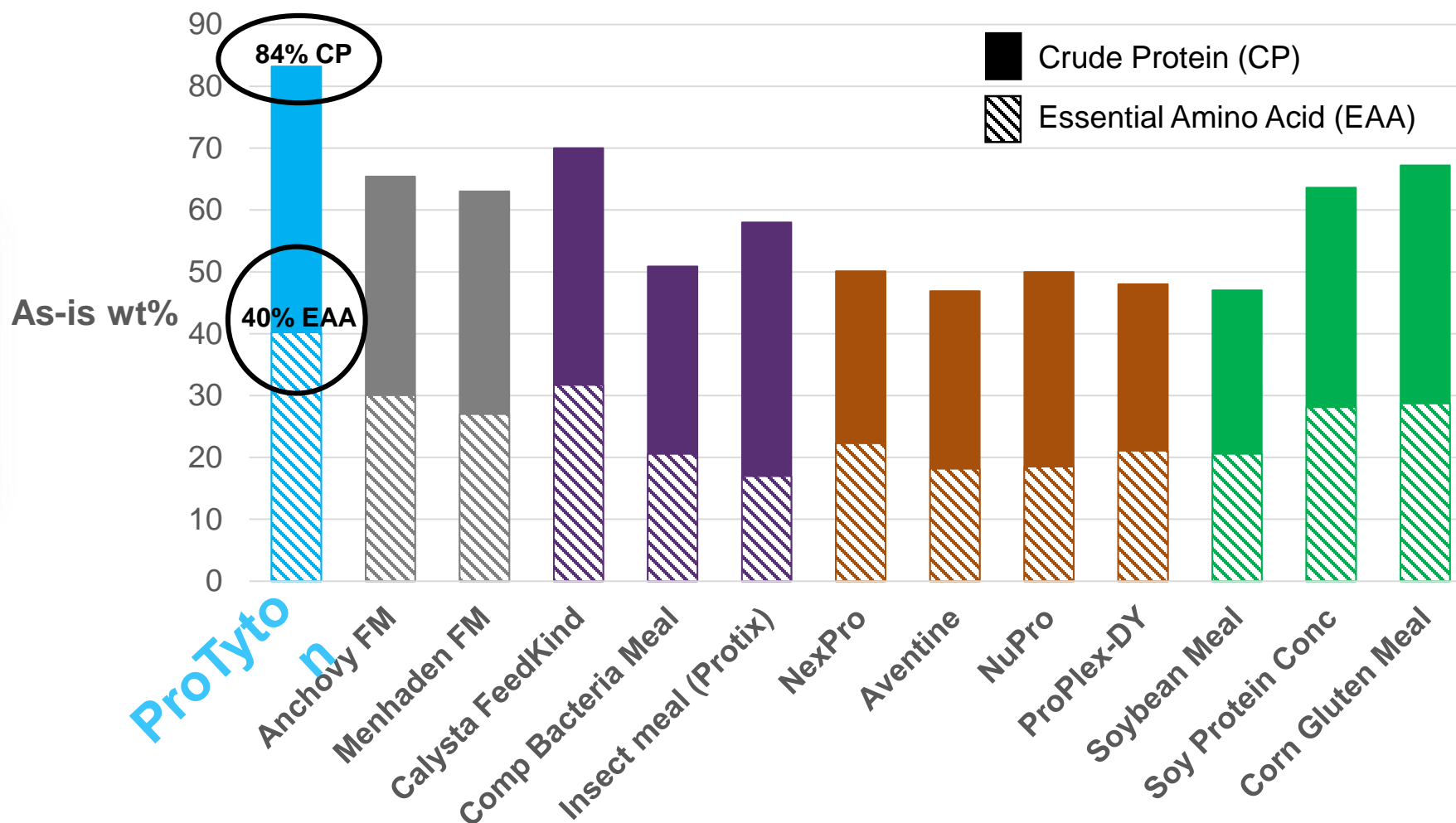
Opportunity to provide Costco an advantage in their NE endeavors

White Dog Labs Product Testing



- **ProTyton** trials ongoing (★) and pending (★)
 - 5 customer qualifications at >100kg scale
- **MiruTyton** trials ongoing (★) and pending (★)
 - 3rd party validation
 - Poultry, swine and dairy cattle
- **BioTyton** trials ongoing (★) and pending (★)
 - *In-ovo* broiler chicken

ProTyton is a Protein Ingredient



ProTyton is a premium protein-ingredient that complements lower cost ingredients, reduces fishmeal inclusion, provides health benefits and is renewable and scalable

ProTyton Stabilizes & Reduces Salmon Feed Costs



Anchovy fishmeal @\$1600/metric ton, ProTyton @ \$1750/metric ton

Salmon Diet		Thermal Growth Coefficient*	Feed Conversion Ratio (FCR)**	Compounded feed \$/metric ton
Reference Fishmeal @\$1600	20% Fishmeal 0% ProTyton	0.23	0.86	\$1250
ProTyton @\$1750/metric ton	10% Fishmeal, 7.5% ProTyton	0.22	0.83	\$1220

* TCG = Rate of Growth ** FCR = Feed/Unit of Growth. Lower is better

Feed Trials
conducted at



Results with 7.5% ProTyton inclusion:

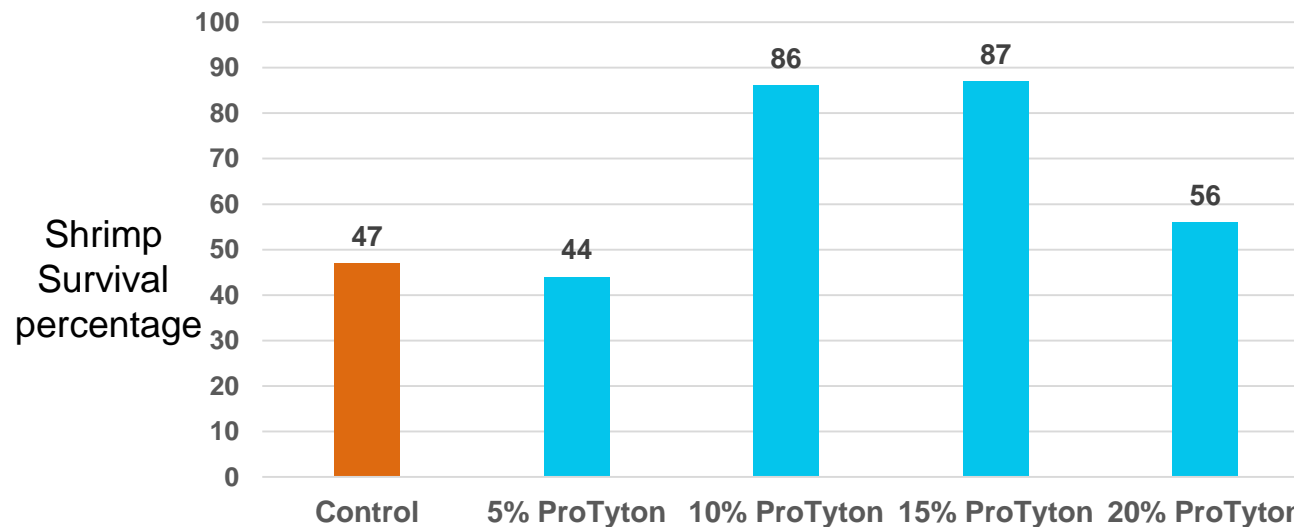
1. Same growth rate
2. Same feed conversion
3. 2.5% total feed cost reduction with ProTyton priced at \$1750/ton

ProTyton lowers total feed cost even when priced at \$1750/metric ton

ProTyton's Health Benefits for Shrimp



Post larval shrimp survival is highly variable



Feed Trials
conducted at



Results with 15% ProTyton:

1. 85% increase in survival
2. 50% faster growth
3. 87% more weight gain per unit of feed

Weight (mg)	340	350	420	500	390
FCR*	1.5	1.7	0.9	0.8	1.3

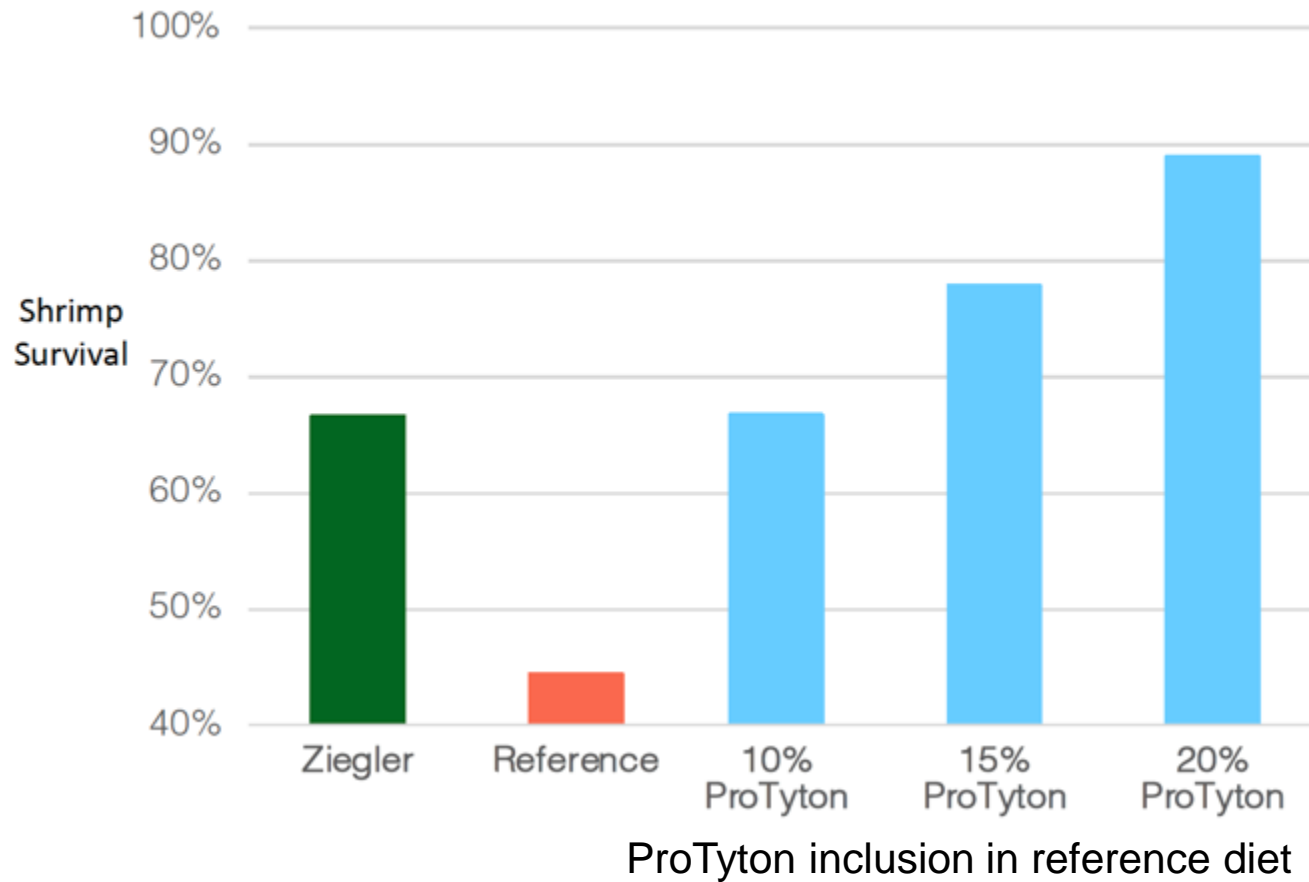
* FCR = Feed/Unit of Growth. Lower is better

Health benefits drive even greater ProTyton \$ value

Biosecurity Benefits in Shrimp



Vibrio parahaemolyticus Challenge of PL40 Shrimp



Disease
Challenges
conducted at

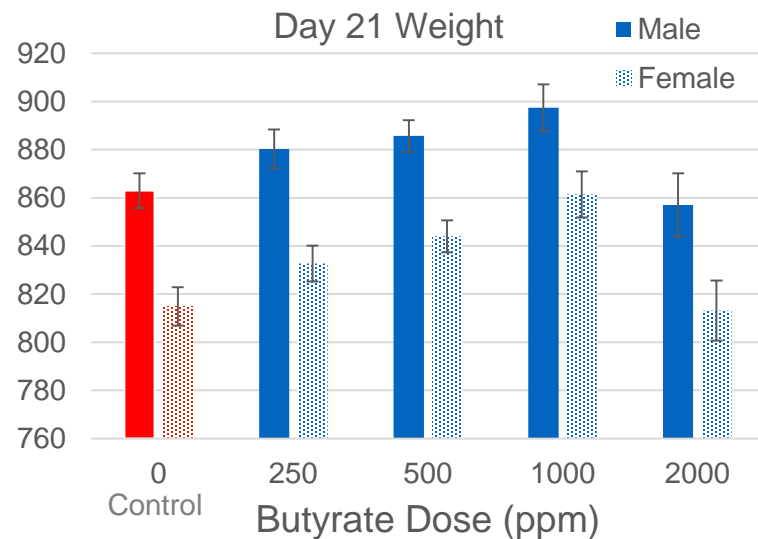


Biosecurity Results:

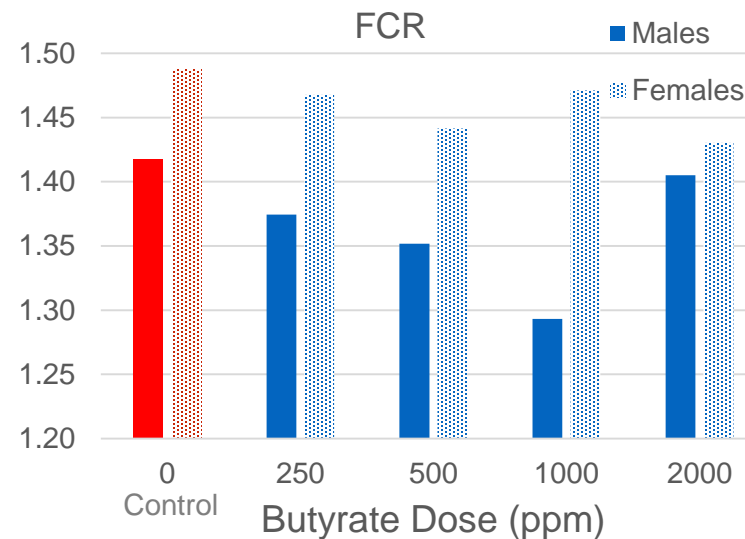
ProTyton reduces *Vibrio* mortality rate by upwards of 66% compared to commercial diets optimized for shrimp health, and boosts reference diet performance in all cases.

ProTyton is an excellent nutrient with significant health benefits

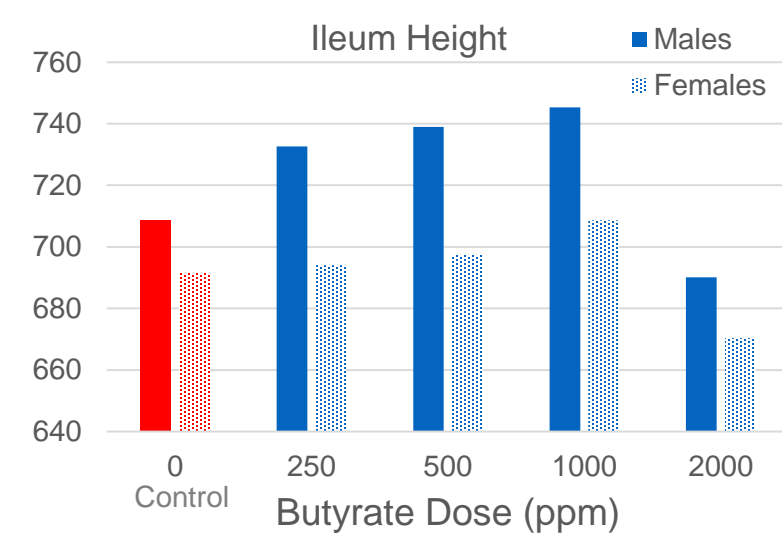
MiruTyton Performance in Broilers



- Males – 4% more growth
- Females – 5.7% more growth



- Males – 12pt improved FCR
- Females – 5pt improved FCR



- Males – 5.2% taller ileum
- Females – 2.5% taller ileum

\$0.06 – 0.10/bird value to integrators, provided at 6:1 ROI



WHITE DOG LABS



THANK YOU